IREM Y. TUMER, PH.D.

Senior Research Scientist
Group Lead, Complex System Design Group
Intelligent Systems Division (Code TI)
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AREAS OF RESEARCH INTEREST:

My research focuses on providing systematic and mathematically sound methods to design and analyze highly complex and integrated systems. Currently, I focus formal methodologies and approaches to incorporate fault prevention, fault detection, diagnosis, and management into the design of such systems, as early in the process as possible. The overall emphasis of my work has been on risk-based design, model-based design, function-based modeling and failure analysis, and system analysis and optimization, primarily applied to aircraft and spacecraft systems. My earlier work focused on developing mathematical tools for vibration monitoring, signal analysis, failure analysis, risk assessment, and reliability.

DEGREES EARNED:

Ph.D. in Mechanical Engineering, May 1998
The University of Texas, Austin, Texas
Dissertation: "Foundations of Condition Monitoring for Design and Manufacturing"

M.S.E. in Mechanical Engineering, May 1995
The University of Texas, Austin, Texas

B.S. in Mechanical Engineering, December 1991
The University of Texas, Austin, Texas

POSITIONS AND FELLOWSHIPS HELD:

September 2000 to Present: NASA Ames Research Center.
Senior Research Scientist (GS Level 15), Intelligent Systems Division.
Group Lead, Complex Systems Design Group. June 2004-Present.
Level 3 Program Manager, Engineering for Complex Systems. Oct 2002-Sept 2004.
Technical Lead, Integrated Health and System Monitoring Group. Oct 2000-Sept 2002.

January 2000 to September 2000: Computer Sciences Corporation (CSC).
Research Scientist, Computational Sciences Division, NASA ARC.
Technical Lead, Integrated Health and System Monitoring Group

July 1998 to December 1999: Caelum Research Corporation.
Research Scientist, Computational Sciences Division, NASA ARC.
Technical Lead, Integrated Health and System Monitoring Group

September 1997 to May 1998: The University of Texas, Austin.
Graduate Research Assistant, Dept. of Mechanical Engineering.

September 1996 to August 1997: The University of Texas, Austin.
University Continuing Fellow.

September 1996 to December 1996: The University of Texas, Austin.
Instructor for Introduction to Mechanical Engineering.

September 1992 to August 1996: The University of Texas, Austin.
Graduate Research Assistant, Dept. of Mechanical Engineering.

June 1992 to August 1992: The University of Texas, Austin.
Undergraduate Research Assistant, Dept. of Mechanical Engineering.
NSF Undergraduate Research Fellowship

September 1991 to May 1992: Houston Instrument. Austin, Texas.
Product Marketing Technician.
Accuracy and repeatability testing.

September 1991 to December 1991: The University of Texas, Austin.
Grader, Dynamic Systems and Control. Dept. of Mechanical Engineering.

January 1990 to May 1990: The University of Texas, Austin.
Grader, Computer Graphics. Dept. of Mechanical Engineering.

June 1988 to August 1990: ROLM Systems. Austin, Texas. (Three full semesters.)
Assistant Engineer.
Cooperative Engineering Program, The University of Texas at Austin.

January 1988 to May 1988: The University of Texas, Austin.
The International Office.
Student assistant for the Study Abroad Exchange Program.

PROFESSIONAL ACTIVITIES:

Research Leadership:

- Group Lead, Complex System Design Group, Intelligent Systems Division, NASA ARC.
- Deputy project lead for the Integrated Systems Health Management (ISHM) Exploration System Research and Technology (ESR&T), Exploration Systems Mission Directorate (ESMD).
- ISHM Design lead, ISHM core team for the Crew Launch Vehicle (CLV) and for the Crew Exploration Vehicle (CEV), Constellation Program, ESMD.
- Lead for ISHM System Analysis & Optimization, Risk Modeling team for the Simulation-Based Acquisition project, ESMD.
- Lead for the critical events risk analysis activity sponsored by the NASA Chief Engineer in response to the DIAZ report in the Columbia Accident Investigation Board (CAIB) results.

Research Program Planning:

- NASA ARC lead of core planning team, Aging Aircraft/Aircraft Safety Program, Aeronautics Research Mission Directorate (ARMD).
- NASA ARC core planning team member, Integrated Vehicle Health Monitoring/Aircraft Safety, ARMD.
- NASA ARC proposal writing team member, Hypersonics/Fundamental Aeronautics Program, ARMD.
- Member of the planning and proposal writing team for the Robotic Lunar Exploration Program, ESMD.
- Member of the Computers, Software, and Automation Integrated Discipline Team for the Advanced Planning and Integration Office (APIO) roadmapping efforts for ESMD's Constellation Program.

Research Program Management:

- Level 3 Project Manager for the Core Risk Research (CRR) project (~$4M/yr) in the Engineering for Complex Systems (ECS) program FY02-FY04.
- Acting Deputy for the System Reasoning and Risk Management (SRRM) Level 2 at NASA ARC (~$7M/yr).
- PI or Co-I on numerous proposals to NASA programs (see full list.)
- Collaborator and Technical Monitor on 11 academic research grants and contracts (see full list.)
- Reviewer on SBIR and other NASA proposals.
- Planning and presentations at non-advocate reviews, ATAC reviews, NRC reviews, internal program and management reviews, Preliminary Design Reviews.
- Budget, workforce and task planning.

Funded Proposals:

Current Funding ($1.6M)

- Crew Launch Vehicle ISHM Design, Constellation Program, ESMD.
- Crew Exploration Vehicle ISHM Analysis and Optimization, Constellation Program, ESMD.
- ISHM Project, Exploration Systems Research & Technology Program, ESMD.
- Aging Aircraft Project, Aircraft Safety Program, ARMD.
- Hypersonic Flight Project, Fundamental Aeronautics Program, ARMD.

***Pending Proposals*:**

- ROSES AISR proposal with Dr. Ali F. Mehr of QSS: An Information-based Framework for Measuring and Optimizing the Informational-worth of NASA's Scientific Experiments ($503K total for 2 years)
- ROSES AISR Proposal with Sandra Hayden and Dr. Tara Estlin of NASA JPL: Health Management of Critical Events for Rovers ($575K total for 3 years)
- ROSES AISR Proposal with Dr. Daniel Gaines of NASA JPL: Intelligent Spacecraft Design for Reducing Risk and Cost of Space Missions ($776K total for 3 years)

Funded and Awarded Proposals:

- SRRM/ACST/ESMD Program: Function-based design and Failure Modes Analysis ($750K, FY05)
- ISHM/CDS/ESMD Program: Modeling and optimization of ISHM Systems ($350K, FY05)
- IS/IDU Program: Anomaly detection for failure-free aerospace missions ($150K/yr, FY03-04)
- SRRM/ECS Program: Design for failure-free missions ($100K/yr, FY02-04)
- Collaborative Engineering Environments/ECS Program l (with Dr. David Ullman, Robust Decisions, Inc.): Risk quantification and decision management for human-agent design teams ($400K, FY04)
- CICT Program: Design for Vehicle Health Monitoring ($150K, FY00-FY02)
- Information Technology Strategic Research (ITSR Program): Condition-Based Maintenance: Analysis and Understanding of Compressor Vibration Data ($150K, FY99-FY00)

Technical Monitoring of Grants and Contracts:

- NASA technical monitor: SBIR grant with Qualtech Systems Inc., “A comprehensive supportability analysis environment for exploration system design.”
- Task requestor and monitor for UARC contract with UC Irvine, Nina Robson, PhD student. “Robotic failure recovery.”
- Task requestor and monitor for UARC contract with UC Berkeley, Julien Sauvageon. MS student, “Sensor fusion for ISHM co-design”.
- Task requestor and monitor for QSS in-house contract, “Modeling and optimization for risk assessment and failure prevention.”
- NASA technical lead and collaborator: Cooperative agreement with Prof. Robert B. Stone, University of Missouri-Rolla, "Analytical Methods to Capture Potential Failure Modes".
- NASA technical lead and collaborator: Cooperative agreement with Prof. Daniel A. McAdams, University of Missouri-Rolla, "Predicting and simulating monitored failure signals: computation and experimentation".
- NASA technical lead and officer: Cooperative agreement with Prof. Chris Paredis, Georgia Institute of Technology, "Epistemic Uncertainty in System Design".
- NASA technical lead and officer: Cooperative agreement with Prof. Alice Agogino, University of California, Berkeley, "IVHM with Smart Dust Sensor Networks".
- NASA technical monitor: Cooperative agreement with Prof. Nancy Leveson, Massachussetts Institute of Technology, "Model Based Hazard Analysis".
- NASA technical monitor: Cooperative agreement with Prof. Ali Mosleh, University of Maryland, ``Simulation based Probabilistic Risk Assessment".
- NASA technical monitor: Cooperative agreement with Prof. Todd Leen, Oregon Graduate Institute, "Model-Biased, Data-Driven, Adaptive Failure Prediction".

NASA Technical Reports*:*

- Khiem Ngo and I. Y. Tumer, “Impact of variations on 1-D flow in gas turbine engines.” NASA TM 2004-212844
- Larry Chao and I. Y. Tumer, “Case study of engineering peer meetings in JPL’s ST-6 project.” NASA TM 2004-212842
- Larry Chao, I. Y. Tumer, and D. G. Bell, “A study of technical engineering peer reviews at NASA.” NASA TM 2004-212843

- Sandra Hayden and I. Y. Tumer, "Design of integrated system health management for critical events". Submitted for review. 2005.
- Sandra Hayden, I. Y. Tumer, "Preliminary report of mission design and operations for critical events." Submitted for review. 2005.

Technical Conference Service:

Conference Chair:
Design for Manufacturing Conference, ASME IDETC. Montreal, Canada. 2002.

Program Chair:
Design for Manufacturing Conference, ASME IDETC. Pittsburg, PA. 2001.

Conference co-organizer:
Integrated Systems Health Engineering and Management Forum, Napa, CA. 2005.

Tutorials Chair:
Design for Manufacturing Conference, ASME IDETC. 1999.

Session Organizer and Chair:
International Design Theory and Methodology Conference, ASME IDETC
Design Automation Conference, ASME IDETC
Design for Manufacturing Conference, ASME IDETC
Computers in Engineering, ASME IDETC
IEEE Aerospace Conference
Meeting of the Society for Machinery Failure Prevention
AFRL Integrated Systems Health Monitoring Conference

Review Coordinator:
International Design Theory and Methodology Conference
Design Automation Conference
Design for Manufacturing Conference

Special Panel and Track Organizer:
- Organizer, Risk Based Design Panel (with Steve Prusha and Dr. Erik Antonsson, NASA Jet Propulsion Laboratory.) Int'l Design Theory & Methodology Conference. 2003.
- Organizer, Risk Based Design Panel (with Dr. David Ullman, Robust Decisions Inc.) Int'l Design Theory & Methodology Conference. 2003.
- Co-organizer, Systems Engineering track, the 2006 ASME Computers in Engineering Conference.
- Co-organizer, Simulation based design under uncertainty, 2006 ASME Design Automation Conference.

ASME Technical Committee Participation:
Design Theory and Methodology Committee; Design for Manufacturing Committee; Design Automation Conference Committee; Risk, Safety and Failure Prevention Committee.

Technical Conference Participation:
- ASME International Design Engineering Technical Conferences (Design Theory and Methodology Conference, Design for Manufacturing Conference, Design Automation Conference, and Mechanical Vibration and Noise Conference)
- ASME International Mechanical Engineering Congress and Exposition
- International Conference on Engineering Design (ICED)
- IEEE Aerospace Conference
- AFRL Integrated Systems Health Management Conference
- International Workshop on Structural Health Monitoring
- AAAI Spring Symposia
- AIAA Joint Propulsion Conference
- Vertical Flight Society's Annual Forum
- Meeting of the Society for Machinery Failure Prevention Technology

Technical Reviewer:

Journals

Research in Engineering Design
ASME Journal of Mechanical Design
ASME Journal of Vibration and Acoustics
ASME Journal of Computing and Information Science in Engineering
Design Studies
Artificial Intelligence in Engineering Design and Manufacturing
Journal of American Helicopter Society
Quality and Reliability Engineering International Journal
Journal of Manufacturing Science and Engineering

Conferences

ASME Design Theory and Methodology
ASME Design for Manufacturing
ASME Design Automation Conferences

NASA

SBIR proposals
STTR proposals
NRA proposals
Unsolicited proposals

Invited papers and presentations:

- Invited paper (and book chapter) and presentation at the First Integrated Health Engineering and Management Conference, Nov. 2005, Napa, CA.
- Invited presentation on Applications of Design Optimization. Clemson University, November 2005.
- Invited paper and presentation at AFRL's Integrated Systems Health Management Conference, Aug. 2005, Cincinnati, OH.
- Invited presentation at the Supportability Environment for ESMD at NASA JSC, July 2005.
- Invited presentation at the NASA Risk Management Conference, Orlando, FL. 2005.
- Invited presentation at the NASA Risk Management Conference, Cleveland, OH. 2004.
- Invited presentation at the IS/Intelligent Data Understanding PI review workshop: Data analysis for engineering data and engineering problems. Dana Point, CA. 2003.
- Invited to organize and chair a special panel on Risk Based Design at ASME's Design Theory and Methodology Conference (2003 and 2004.)
- Invited panelist, Stanford NPI Roundtable on Reliability Validation and Time to Market, Stanford, CA, 2003.
- Invited speaker at the AAAI Spring Symposia, Workshop on Information refinement and decision making for diagnostics and prognostics. Stanford, CA. 2002.
- Invited speaker, 4th Annual Key Characteristics and Variation Risk Mgt Symposium. Long Beach, CA, 2000.
- Invited article, Advanced manufacturing Technology Newsletter. Vol.21, No.8, 2002.
- Invited panelist: Special panel on emerging issues: opportunities and directions in quality, statistics, and reliability, INFORMS'2001. 2001.
- Invited reviewer at the C-17 Dryden Program Review Meeting, P&W, Hartford, CT. 2001.
- Invited speaker at the AAAI Spring Symposia, Workshop on the Use of AI in Equipment Maintenance and Manufacturing. Stanford, CA. 1999.
- Presentations at NASA internal programmatic reviews, Preliminary Design Reviews, and NRC reviews.

Honors, Awards, & Recognition:

- "Distinguished" rating, NASA Employee Performance (EPCS)
- NASA Performance and Merit Awards, January 2001-August 2005.
- NASA Ames Research Center Spotlight Award, 2003.
- Highly Commended Paper Award, J. of Quality in Maintenance Eng., 2002 Volume.
- Best Paper Award, American Helicopter Society's Annual Forum, May 2000.
- Winner of Best Paper Award, Graduate Studies Division, ASEE'98, Seattle, WA
- University of Texas Continuing Fellowship: 1996-1997.
- Alcoa Foundation Fellowhip, Alternate Winner: 1995-1996.
- Winner of Student Design Competition in RESNA '95.
- NSF Undergraduate Summer Program Fellowship Recipient: 1992.

- Undergraduate Fellowships and Recognition:
  Dean's Honor Roll: Spring 1988, Spring 1989, Fall 1990, Spring 1991.
  Dean's List: Fall 1987.
  Mechanical Engineering Departmental Scholarship: 1989-1991.
  Jesse Jones Scholarship: 1987-1991.
  Physics Department Scholarship: Fall 1986.

Professional Societies:

Member of American Society of Mechanical Engineers.
Member of Pi Tau Sigma Honor Society.
Ex-member of Society of Manufacturing Engineers
Ex-member of American Helicopter Society
Ex-member of American Society of Engineering Education

EDUCATIONAL AND SUPERVISORY ACTIVITIES:

Supervisory Roles:

- Masters Thesis Committee Member: Andy Roberts, Srikesh Arunajadai, Mike Stock, University of Missouri-Rolla (all graduated).
- PhD Thesis Committee Member: Larry Chao, Stanford University (graduated).
- Supervision (with funding) of PhD students: Paul Constantine, Stanford University; Nina Robson, University of California at Irvine; Ryan Hutcheson, University of Missouri-Rolla.
- Supervision of summer interns at NASA ARC (2000-2005): Ryan Hutcheson (UMR), Jeremy Johnson (UMR), Julien Sauvageon (Berkeley), Paul Constantine (Stanford), Larry Chao (Stanford), Matt Bohm (UMR), Mike VanWie (Postdoc), Scott Uder (UMR), Andy Roberts (UC Irvine).
- Educational Associates Program, NASA Ames Research Center. Supervising and funding two PhD students, 2005-2006 academic year.
- MUSE Program at Santa Clara University, CA. Mentor for first-year undergraduate student, 1999.

Teaching:

- *Introduction to Mechanical Engineering*
  Team-taught and developed a hands-on freshman introductory engineering course.
  Topics: Mechanical Dissection, Reverse Engineering, Modeling, Manufacturing Processes.

- *Supervised Teaching in Mechanical Engineering*
  Delivered and critiqued lectures.
  Topics included: Fourier Transform and Power Spectrum; Reverse Engineering.

Other Educational Activities:

- Invited and funded to attend a workshop on *Junior Faculty Development* at the ASEE National Conference in Milwaukee, WI, June 1997.
- Established the *ASEE Student Chapter* at The University of Texas at Austin. Information Resources Officer, Fall 1996-Spring 1997.
- Publications in the ASEE Conference in 1997 and 1998.
- *Discover Engineering*, Panelist in a live NTU broadcast to answer questions from high school students interested in becoming engineers, February 1997, Lisle, IL.
- *Women in Engineering Program*:
  Careers in Engineering for Women, Team Advising Engineer and Project Judge. Summer 1996.
  Tool Time, Supervisor of Power Tools. Fall 1996.

PUBLICATIONS:

Archival Journal Articles:

1. R. B. Stone, I. Y. Tumer, "The Elemental Function-Failure Design Method." ASME *Journal of Mechanical Design*. 127(3): 397-407. 2005.
2. M. E. Stock, R. B. Stone, I. Y. Tumer, "Linking product functionality to historical failures to improve failure analysis in design." Journal of *Research in Engineering Design*. In print. 2005.

3. D. A. McAdams and I. Y. Tumer, "Toward Intelligent fault detection in turbine blades: Variational vibration models of damaged pinned-pinned beams." ASME *Journal of Vibration and Acoustics*. In print. 2005.
4. S. G. Arunajadai, R. B. Stone, I. Y. Tumer, "Failure mode identification through clustering analysis." *Quality and Reliability Engineering International Journal*. 20:511-526. 2004.
5. I. Y. Tumer, R. B. Stone, "Mapping Function to Failure during High-Risk Component Development." Journal of *Research in Engineering Design*. Vol. 14, 2003, pp.25-33.
6. I. Y. Tumer, E. M. Huff, "Analysis of Triaxial Vibration Data for Health Monitoring of Helicopter Gearboxes." ASME *Journal of Vibration and Acoustics*. Vol.125, No.1, pp.120-128. 2003.
7. I. Y. Tumer, E. M. Huff, "On the Effects of Production and Maintenance Variations on Rotating Machinery Component Performance." *Journal of Quality in Maintenance and Engineering*. Vol. 8, No. 3, pp.226-238. 2002. (Highly Commended Award, 2002 Journal Volume, Emerald Literati Club.)
8. E. M. Huff, I. Y. Tumer, E. Barszcz, M. Dzwonczyk, J. McNames, "Analysis of Maneuvering Effects on Transmission Vibrations in an AH-1 Cobra Helicopter." *Journal of the American Helicopter Society*. Volume 47, No. 1, pp. 42-49. January 2002.
9. I. Y. Tumer, K. L. Wood, I. J. Busch-Vishniac, "Monitoring of Manufacturing Signals Using the Karhunen-Loeve Transform." *Mechanical Systems and Signal Processing Journal*, 2000, 14(6), pp.1011-1026.
10. I. Y. Tumer, K. L. Wood, I. J. Busch-Vishniac, "A Mathematical Transform to Improve Part Surface Quality in Manufacturing." The ASME *Journal of Manufacturing Science and Engineering*. Volume 122, No. 1, pp. 273-279. February 2000.
11. I. Y. Tumer, D. C. Thompson, R. H. Crawford, K. L. Wood, "Characterization of Surface Fault Patterns, with Application to a Layered Manufacturing Process." The *Journal of Manufacturing Systems*, Volume 17, No.1, pp.23-36, 1998.
12. I. Y. Tumer, R. S. Srinivasan, K. L. Wood, "Investigation of Characteristic Measures for the Analysis and Synthesis of Precision-Machined Surfaces." The *Journal of Manufacturing Systems*, Volume 14, No.5, pp.378-392, 1995.

Journal Articles in Review:

13. A. F. Mehr and I. Y. Tumer. Risk Based Decision Making for Managing Resources during the Design of Complex Aerospace Systems. **In review**. 2005.
14. K. Grantham, R. B. Stone, and I. Y. Tumer. The Risk in Early Design Method. **In review**. 2005.
15. S. J. Uder, R. B. Stone, I. Y. Tumer, J. P. Vukovich. Development of a Failure Mode Vocabulary and Knowledge Base to Aid Conceptual Design of Spacecraft. **In review**. 2005.
16. I. Y. Tumer, R.B. Stone, R. A. Roberts, M. VanWie, "Decomposition-based failure mode identification method for risk-free design in large systems." **In review**. 2005.
17. D. A. McAdams, D. Comella, and I. Y. Tumer, "Determining natural frequencies of cracked beams for fault detection." **In review**. 2005.
18. K. Ngo and I. Y. Tumer, "Variations of 1-D flow in gas turbine engines." **In review**. 2005.
19. R. A. Roberts, R. B. Stone, I. Y. Tumer, "Application of function-failure similarity method to rotorcraft component design." **In review**. 2005.
20. D. A. McAdams and I. Y. Tumer, "Modeling variability in dynamic systems for vehicle health monitoring." **In review**. 2005.

Book Chapters:

21. I. Y. Tumer, R.S. Srinivasan, K. L. Wood, "Analysis and Synthesis of Engineering Surfaces to Bridge Manufacturing and Design." Invited book chapter, *Computer Aided and Integrated Manufacturing Systems Techniques and Applications*, Volume VI: Manufacturing Systems Processes. pp. 1:1-45. CRC Press. 2001.

Fully Refereed Conference Articles:

ASME IDETC Articles:

22. A. F. Mehr and I. Y. Tumer. "A new approach to probabilistic risk analysis in the early stages of concurrent and distributed design of aerospace systems." ASME *Design Automation Conference*. 2005. DETC2005-85056. Long Beach, CA. 2005.
23. K. Grantham, M. VanWie, R. Stone, I. Y. Tumer, and F. Barrientos. An Analysis of Risk and Function Information in Early Stage Design. In ASME *Design Theory and Methodology Conference*. DETC2005-85405. Long Beach, CA, 2005.
24. K. Grantham, R. Stone, and I. Y. Tumer. Function-Based Risk Assessment: Mapping Function to Likelihood. In ASME *Design Theory and Methodology Conference*. DETC2005-85053. Long Beach, CA, 2005.
25. I. Y. Tumer, F. Barrientos, A. F. Mehr. "Towards Risk Based Design for NASA Missions: A Review of Practice and Research Trends at NASA." ASME *Reliability, Safety, and Failure Prevention Conference*. DETC2005-85100. Long Beach, CA. 2005.

26. S. J. Uder, R. B. Stone, and I. Y. Tumer. Failure analysis in subsystem design for space missions. ASME *Design Theory and Methodology Conference*. DETC2004-57338. Salt Lake City, UT 2004.
27. L. P. Chao, I. Y. Tumer, K. Ishii, Design process error-proofing: engineering peer review lessons from NASA. ASME *Design for Manufacturing Conference*. DETC2004, Salt Lake City, UT 2004.
28. M. E. Stock, R. B. Stone, I. Y. Tumer, "Going back in time to improve design: The Elemental Function-Failure Design Method." ASME *Design Theory and Methodology Conference*. DETC2003/DTM-48633. Chicago, IL. September 2003.
29. S. G. Arunajadai, R. B. Stone, I. Y. Tumer, "A framework for creating a function-based design tool for failure mode identification." ASME *Design Theory and Methodology Conference*. DETC2002/DTM-34018. Montreal, Canada. September 2002.
30. D. A. McAdams and I. Y. Tumer, "Towards failure modeling in complex dynamic systems: impact of design and manufacturing variations." ASME *Design for Manufacturing Conference*. DETC2002/DFM-34161. Montreal, Canada. September 2002.
31. R. A. Roberts, R. B. Stone, I. Y. Tumer, "Deriving function-failure similarity information for failure-free rotorcraft component design." ASME *Design for Manufacturing Conference*. DETC2002/DFM-34166. Montreal, Canada. September 2002.
32. I. Y. Tumer, R. B. Stone, "Analytical Method to Evaluate Failure Potential during High-Risk Component Development." ASME *Design for Manufacturing Conference*. DETC2001-DFM21173. Pittsburgh, PA. September 2001.
33. I.Y. Tumer, E.M. Huff, "Using Triaxial Vibration Data for Vibration Monitoring of Helicopter Gearboxes." ASME *Mechanical Vibration and Noise Conference*. DETC2001-VIB21755. Pittsburgh, PA. 2001.
34. I. Y. Tumer, E. M. Huff, "Evaluating Manufacturing and Assembly Errors in Rotating Machinery to Enhance Component Performance." ASME *Design for Manufacturing Conference*. DETC00-DFM14006. Baltimore, MD. September 2000.
35. I. Y. Tumer, K. L. Wood, I. J. Busch-Vishniac, "Condition Monitoring Methodology in Manufacturing and Design." ASME *Design for Manufacturing Conference*. DETC98-DFM5824. Atlanta, GA. September 1998.
36. I. Y. Tumer, K. L. Wood, I. J. Busch-Vishniac, "Monitoring Fault Condition During Manufacturing Using the Karhunen-Loeve Transform." ASME *Mechanical Vibration and Noise Conference*. DETC97-VIB4234. Sacramento, CA. September 1997.
37. I. Y. Tumer, K. L. Wood, I. J. Busch-Vishniac, "Improving Manufacturing Precision Using the Karhunen-Loeve Transform." ASME *Design for Manufacturing Conference*. DETC97-DFM4347. Sacramento, CA. September 1997.
38. I. Y. Tumer, R. S. Srinivasan, K. L. Wood, "Characteristic Measures for the Representation of Manufactured Surfaces." ASME *Design for Manufacturing Conference*. DETC96-DFM1275. Irvine, CA. 1996.
39. I. Y. Tumer, R. S. Srinivasan, K. L. Wood, I. J. Busch-Vishniac, "Fractal Precision Models of Lathe-Type Turning Machines." ASME *Design Automation Conference*. Volume 65-2, pp.501-513. Albuquerque, NM. September 1993.

ASME IMECE Articles:

40. R. Hutcheson and I. Y. Tumer. "Function-based design of a spacecraft power subsystem diagnostics testbed". ASME *International Mechanical Engineering Congress and Exposition*. IMECE2005-81120. Orlando, FL. 2005.
41. I. Y. Tumer, A. F. Mehr, F. A. Barrientos, D. Ullman. "An Information-Exchange Tool for Capturing and Communicating Decisions during Early-Phase Design and Concept Evaluation." ASME *International Mechanical Engineering Congress and Exposition*. IMECE2005-81690. Orlando, FL. 2005.
42. B. Mitchell, D. A. McAdams, R.B. Stone, I. Y. Tumer. Computational Methods to Predict and Avoid Failure. ASME *International Mechanical Engineering Congress and Exposition*. IMECE2005-79907. Orlando, FL. 2005.
43. L. P. Chao, I. Y. Tumer, K. Ishii. Design process error-proofing: Lessons from and challenges for NASA. In ASME *International Mechanical Engineering Congress and Exposition*. IMECE2005-79451. Orlando, FL. 2005.
44. I. Y. Tumer, F. A. Barrientos, L. Meshkat. Risk Based Design for NASA's missions: Past and Future. ASME International Mechanical Engineering Congress and Exposition. IMECE2004-60829. Anaheim, CA. 2004.
45. S. J. Uder, R.B. Stone, and I. Y. Tumer. Functional Modeling for Failure Cause and Effect Identification in the Design of Space Subsystems. ASME *International Mechanical Engineering Congress and Exposition*. IMECE2004-60846. Anaheim, CA. 2004.
46. M. E. Stock, R. B. Stone, I. Y. Tumer, "Comparing two levels of functional detail for mapping historical failures: you are only as good as your knowledge base." ASME *International Mechanical Engineering Congress and Exposition*. IMECE2003-41593. Washington, D.C. November 2003.
47. D. A. McAdams, D. Comella, I. Y. Tumer, "Developing variational vibration models of damaged beams: toward intelligent failure detection." ASME *International Mechanical Engineering Congress and Exposition*.

IMECE2003-42540. Washington, D.C. November 2003.

48. R. A. Roberts, I. Y. Tumer, R. B. Stone, A.F. Brown, "A function-based exploration of JPL's problem and failure reporting database." ASME *International Mechanical Engineering Congress and Exposition*. IMECE2003-42769. Washington, D.C. November 2003.
49. S. G. Arunajadai, R. B. Stone, I. Y. Tumer, "A clustering based approach for failure mode identification." ASME *International Mechanical Engineering Congress and Exposition*. IMECE2002-DE-34422. New Orleans, LA. November 2002.
50. I. Y. Tumer, R. B. Stone, R. A. Roberts, "Towards failure-free design: Reducing dimensionality in function-failure similarity analysis for large databases." ASME *International Mechanical Engineering Congress and Exposition*. IMECE2002-33473. New Orleans, LA. November 2002.

NON-ASME Conference Articles:

51. I. Y. Tumer, "Towards ISHM Co-Design: Methods and practices for fault avoidance and management during Early phase design". *1st Integrated Systems Health Engineering and Management Forum* (to be published as a book chapter). November 2005, Napa, CA.
52. M. VanWie, M. Bohm, R. B. Stone, I. Y. Tumer, and F. A. Barrientos. Learning from failures: archiving and designing with failure and risk. *Computer Aided Industrial Design and Conceptual Design Conference*, Delft, Netherlands, May 2005.
53. A. F. Mehr, I. Y. Tumer, Barszcz, E. "Optimal Design of Integrated Systems Health Management (ISHM) Systems for Improving the Safety of NASA's Exploration Missions: A Multidisciplinary Design Approach", *WCSMO'06*, Rio de Janeiro, Brazil, 2005.
54. F. A. Barrientos, E. R. Pedersen, I. Y. Tumer. Towards Failure-Based Decision Making during Design: User-Centered Design Approach. In *IEEE International Conference on Systems, Man, and Cybernetics*. Oct 2005.
55. R. Hutcheson and I. Y. Tumer. "Function-based Co-design Paradigm for Robust Health Management." *The 5th International Workshop on Structural Health Monitoring*. Stanford, CA. September 2005.
56. A. F. Mehr, I. Y. Tumer. "Two-Level Optimization of Systems Health Monitoring in Systems with Top-Down Hierarchical Architecture". *The 5th International Workshop on Structural Health Monitoring*. Stanford, CA. September 2005.
57. N. Oza, I. Y. Tumer, K. Tumer, E. M. Huff, "Classification of aircraft maneuvers for fault detection." *Multiple Classifier Systems Workshop*. Surrey, England, July 2003.
58. I. Y. Tumer, R. B. Stone, D. G. Bell, "Requirements for a failure mode taxonomy for use in conceptual design." *International Conference on Engineering Design*, Paper No. 1612, Stockholm, Sweden. August 2003.
59. I. Y. Tumer, K. L. Wood, I. J. Busch-Vishniac, "Extraction of Fault Features on SLS Part Surfaces Using the Karhunen-Loeve Expansion Technique." *The 1996 Solid Freeform Fabrication Symposium*, pp. 575-585, Austin, TX. August 1996.
60. I. Y. Tumer, D. C. Thompson, R. H. Crawford, K. L. Wood, "Quantification of Part Surface Quality: Application to Selective Laser Sintering." *The 1996 World Automation Conference*, pp. 731-736, Montpellier, France. May 1996.
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64. K. V. Ngo and I. Y. Tumer, "Impact of variations on 1-D flow in gas turbine engines via MC simulations." *IEEE Aerospace Conference*. March 2004.
65. I. Y. Tumer and E. M. Huff, "Principal components analysis of triaxial vibration data from helicopter transmissions." The *56th Meeting of the Society for Machinery Failure Prevention Technology*, pp. 331-341. Virginia Beach, VA, April 2002.
66. E. M. Huff, I. Y. Tumer, M. Mosher, "An Experimental Comparison of Transmission Vibration Responses from OH-58c and AH-1 Helicopters." The *Vertical Flight Society's 57th Annual Forum*, American Helicopter Society, Washington, D.C., May 2001.
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69. I. Y. Tumer and A. Bajwa, "A Survey of Aircraft Engine Health Monitoring Systems". *The 1999 Joint Propulsion Conference,* Aerospace Systems Condition Monitoring session, Los Angeles, CA. June 1999.
70. D. A. McAdams, I. Y. Tumer, and K. L. Wood, "An Overview of Tolerance Design for Function and Manufacturing Precision in Product Design." T1998 *NSF Design and Manufacturing Conference*, Monterrey, Mexico, January 5-8, 1998.
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72. I. Y. Tumer and A. Bajwa, "Learning about how Aircraft Engines Work and Fail". *The 1999 Joint Propulsion Conference*, Propulsion Education session, Los Angeles, CA. June 1999.
73. I. Y. Tumer and L. F. Arthur, "Benefits of Team-Teaching for Doctoral Students Preparing for an Academic Career." *The 1998 ASEE Annual Conference*, Graduate Studies Division, Seattle, Washington. June 1998. (Best Paper Award.)
74. E. Matsumoto, L. F. Arthur, I. Y. Tumer, J. Gray, "How to Establish an ASEE Student Chapter?" *The 1997 ASEE Annual Conference*, Milwaukee, WI, June 1997, Paper No.2312.
75. R. Cavin, I. Y. Tumer, M.W. Foohey, "Design of Work Jigs to Assist the Disabled in Sheltered Workshops in the Production of Sample Display Chains." *The 1995 Rehab. Engineering Society of North America Conference (RESNA '95)*, Vancouver, BC, Canada, pp.725-727. June 1995. Winner of the Design Competition.

Thesis Dissertation:

76. I. Y. Tumer, "Foundations of Condition Monitoring for Design and Manufacturing." The University of Texas at Austin. May 1998.

ADDITIONAL PROPOSAL INVOLVEMENT: (incorporated into directed funding)

Exploration Systems Mission Directorate Proposals :

- AR/IS/CICT Program: NRA proposal with Prof. Mike McCarthy at UC Irvine (Step 1 & 2): Geometric reasoning in support of NASA science missions relying on robotic arms (AWARDED but cancelled.)
- Phase 2 ESMD Extramural proposal with Dr. David Ullman of Robust Decisions Inc. and Ken Fertig of Rockwell Scientific: Trade Studies and Uncertainty in Early System-of-System
- Phase 2 ESMD Extramural proposal with Prof. Chris Paredis of Georgia Tech and Dr. Scott Ferson of Applied Biomathematics: A Framework for Accurate Risk Assessment in CEV Design
- Phase 2 ESMD Extramural proposal with Prof. Gabor Karsai of Vanderbilt University and Dr. Kirby Keller of Boeing: Integrated Health Management and Control for Spacecraft
- Phase 2 ESMD Extramural proposal with Dr. Michael Dorneich of Honeywell and Prof. Caroline Hayes of University of Minnesota: Affordable Mission Design Excellence: Dynamic Interdependence
- Phase 2 ESMD Extramural proposal with Prof. Michael McCarthy of UC Irvine and Dr. Richard Dearden of RIACS: Automated Failure Recovery of Habitation Servicers
- Phase 2 Intramural ESMD Proposal with David Alfano, NASA ARC and Prof. Nancy Leveson of MIT: Rigorous Software Engineering for Project Constellation
- Phase 2 Intramural ESMD Proposal with Dr. Mark Shirley of NASA ARC: Increased Safety with Caution and Warning

Intelligent Systems Program Proposals:

- IS/AR proposal with Dr. Daniel Gaines at JPL (Step 1 & 2): Intelligent Spacecraft Design to enable Robust Science Missions.
- IS/HCC proposal with Prof. Yan Jin at USC (Step 1 & 2): Toward agent based extreme collaboration for space mission design (decision on hold due to Code T transition.)
- IS/IDU proposal with Prof. Andrew Kusiak at Univ, of Iowa (Step 1 & 2): Data mining for prediction of catastrophic failures: a hybrid approach (decision on hold due to Code T transition.)
- IS/IDU proposal with Prof. Daniel McAdams at Univ. of Missouri-Rolla (Step 1& 2): Understanding component failure data characteristics for intelligent fault detection
- IS/IDU Step 1 proposal with Prof. Kos Ishii at Stanford University: Model-based Knowledge discovery from engineering data for reliable aerospace missions

- IS/HCC Step 1 proposal with Prof. Larry Leifer at Stanford University: Question/Decision duality theory: an application to NSA mission design review process management

Engineering for Complex Systems Program Proposals:

- ECS/CEE proposal with Dr. David Bell and Dr. Peter Putz, RIACS, NASA ARC: Functional and Dysfunctional Effects of Reviews
- ECS/CEE proposal with Prof. Yan Jin at University of Southern California: Agent-Based Negotiation Network for Collaborative Engineering

Participation in Other Proposals:

- CPPM proposal with Prof. Kos Ishii, Stanford University: Error Proofing of Design Reviews at NASA.
- Concept Design Shop Proposal, Vehicle Systems Program, NASA.
- NSF IGERT proposal with Prof. Robert Stone at the University of Missouri-Rolla
- DDF proposal: Variation Analysis and Modeling in complex aerospace systems
- Code Q internal proposal with JPL: Risk Management Guideline Improvements Based on Analysis of ATLO, Launch and Flight Data from the JPL Problem/Failure Database
- AFRL proposal on Design for Monitoring

PERSONAL DATA:

Citizenship:	US Citizen
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	Husband: Dr. Kagan Tumer
Hobbies:	Sailing, skiing, drawing, yoga, traveling
References:	Available upon request